SEQUENCE LISTING

<110> Universiteit Utrecht Holding B.V.

<120> Piroplasmid vaccine

<130> 2003-010

<160> 20

<170> PatentIn version 3.2

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aag cgc atg ctt tgt atg gct ctt gta cca gtt atc tta tcg tca ttt      96
Lys Arg Met Leu Cys Met Ala Leu Val Pro Val Ile Leu Ser Ser Phe
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ttt gcg gaa gat gct tta gct tcc aac tcc acg ctt ttc gct ttc cac     144
Phe Ala Glu Asp Ala Leu Ala Ser Asn Ser Thr Leu Phe Ala Phe His
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aag gaa cca aac aat cgt agg ctt acc aaa agg tct tca aga gga cag     192
Lys Glu Pro Asn Asn Arg Arg Leu Thr Lys Arg Ser Ser Arg Gly Gln
        50                  55                  60

ttg ctc aac tca agg agg ggt tcg gat gat gcg tcc gaa tct tcc gat     240
Leu Leu Asn Ser Arg Arg Gly Ser Asp Asp Ala Ser Glu Ser Ser Asp
65                  70                  75                  80

aga tac cca ggt agg tcg ggt ggc tct aag aat tcg agc caa tcc ccc     288
Arg Tyr Pro Gly Arg Ser Gly Gly Ser Lys Asn Ser Ser Gln Ser Pro
                85                  90                  95

tgg atc aag tat atg caa aag ttc gac att ccc cgt aac cac ggc tct     336
Trp Ile Lys Tyr Met Gln Lys Phe Asp Ile Pro Arg Asn His Gly Ser
                100                 105                 110

gga atc tat gtc gat ctt gga gga tat gaa tcc gtt ggt tca aaa agt     384
Gly Ile Tyr Val Asp Leu Gly Gly Tyr Glu Ser Val Gly Ser Lys Ser
            115                 120                 125

tat cgt atg ccc gtt ggt aag tgc cca gta gtc ggt aaa att ata gac     432
Tyr Arg Met Pro Val Gly Lys Cys Pro Val Val Gly Lys Ile Ile Asp
        130                 135                 140

ctt gga aat ggt gcc gac ttc ctc gat ccc att tca tca gac gac cca     480
Leu Gly Asn Gly Ala Asp Phe Leu Asp Pro Ile Ser Ser Asp Asp Pro
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      145                    150                    155                    160

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                165                    170                    175

ccc aca caa cca aag aca cgt ggt tct tca tca gca tct gcg gcc aaa      576
Pro Thr Gln Pro Lys Thr Arg Gly Ser Ser Ser Ala Ser Ala Ala Lys
            180                    185                    190

tta tct cct gtt tcg gcg aaa gat ctg aga cgt tgg gga tat gaa ggt      624
Leu Ser Pro Val Ser Ala Lys Asp Leu Arg Arg Trp Gly Tyr Glu Gly
        195                    200                    205

aat gat gta gcg aat tgc tca gaa tat gct agt aac ctc att ccc gca      672
Asn Asp Val Ala Asn Cys Ser Glu Tyr Ala Ser Asn Leu Ile Pro Ala
    210                    215                    220

tca gac agg agt acc aaa tat agg tat cct ttt gtt ttt gac agt gat      720
Ser Asp Arg Ser Thr Lys Tyr Arg Tyr Pro Phe Val Phe Asp Ser Asp
225                    230                    235                    240

aac cag atg tgt tac ata ctg tac tct gcc ata caa tac aac caa gga      768
Asn Gln Met Cys Tyr Ile Leu Tyr Ser Ala Ile Gln Tyr Asn Gln Gly
                245                    250                    255

aat agg tat tgt gac aac gat ggt agc tcc gaa gat ggt aca agc tct      816
Asn Arg Tyr Cys Asp Asn Asp Gly Ser Ser Glu Asp Gly Thr Ser Ser
            260                    265                    270

ttg ctt tgc atg aaa cct tac aag agc gct gag gat gca cac tta tac      864
Leu Leu Cys Met Lys Pro Tyr Lys Ser Ala Glu Asp Ala His Leu Tyr
        275                    280                    285

tac ggt tct gcg aaa gtt gac ccc gat tgg gaa gaa aat tgt ccc atg      912
Tyr Gly Ser Ala Lys Val Asp Pro Asp Trp Glu Glu Asn Cys Pro Met
    290                    295                    300

cac ccg gta agg gat gcc att ttt ggt aaa tgg tct ggt ggc tct tgt      960
His Pro Val Arg Asp Ala Ile Phe Gly Lys Trp Ser Gly Gly Ser Cys
305                    310                    315                    320

gtt gcc att gct cct gca ttc caa gaa tat gcc aac agc act gaa gac     1008
Val Ala Ile Ala Pro Ala Phe Gln Glu Tyr Ala Asn Ser Thr Glu Asp
                325                    330                    335

tgt gca gcc att tta ttc gat aac tct gca act gac ttg aat atc gaa     1056
Cys Ala Ala Ile Leu Phe Asp Asn Ser Ala Thr Asp Leu Asn Ile Glu
            340                    345                    350

gct gtt aac gaa gat ttt aat gaa ctt aaa gaa ttg acc gat ggg ctt     1104
Ala Val Asn Glu Asp Phe Asn Glu Leu Lys Glu Leu Thr Asp Gly Leu
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aaa aga ttg aac atg tcg aag gtt gca aac gct att ttt tct ccc ctc     1152
Lys Arg Leu Asn Met Ser Lys Val Ala Asn Ala Ile Phe Ser Pro Leu
    370                    375                    380

tcc aat gtt gca ggt acc agt cga att tca cgt ggt gtg ggt atg aac     1200
Ser Asn Val Ala Gly Thr Ser Arg Ile Ser Arg Gly Val Gly Met Asn
385                    390                    395                    400
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tgg gct aca tac gat aaa gat tct ggt atg tgt gct ctc att aac gaa   1248
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aca cct aac tgc ttg atc ttg aac gcg gga agc att gct ctc acg gct   1296
Thr Pro Asn Cys Leu Ile Leu Asn Ala Gly Ser Ile Ala Leu Thr Ala
            420             425             430

ata ggt tca cct ctc gag tat gac gct gtt aac tat cct tgc cac atc   1344
Ile Gly Ser Pro Leu Glu Tyr Asp Ala Val Asn Tyr Pro Cys His Ile
            435             440             445

gac acc aat ggt tac gtt gag cca cgt gca aag aat acc aac aaa tac   1392
Asp Thr Asn Gly Tyr Val Glu Pro Arg Ala Lys Asn Thr Asn Lys Tyr
    450             455             460

ctt gat gtt cct ttc gag gtc aca act gct ttg agc atg aag aca cta   1440
Leu Asp Val Pro Phe Glu Val Thr Thr Ala Leu Ser Met Lys Thr Leu
465             470             475             480

aaa tgc gat gcc tat gtt cac acc aag tac tct gac agt tgt ggt acc   1488
Lys Cys Asp Ala Tyr Val His Thr Lys Tyr Ser Asp Ser Cys Gly Thr
            485             490             495

tat ttc ctt tgc tca gac gtc aaa cct aac tgg ttc att agg ttc tta   1536
Tyr Phe Leu Cys Ser Asp Val Lys Pro Asn Trp Phe Ile Arg Phe Leu
            500             505             510

cac atg atc gga ctc tac aac aca aag cgt atc gta ata ttc gtg tgc   1584
His Met Ile Gly Leu Tyr Asn Thr Lys Arg Ile Val Ile Phe Val Cys
            515             520             525

tgt acc act acc gcc atc gtt ctc act atc tgg ata tgg aaa cga ttc   1632
Cys Thr Thr Thr Ala Ile Val Leu Thr Ile Trp Ile Trp Lys Arg Phe
            530             535             540

atc aag gct aag aaa gag ccg gcc cct cca agt ttc gac aaa tac cta   1680
Ile Lys Ala Lys Lys Glu Pro Ala Pro Pro Ser Phe Asp Lys Tyr Leu
545             550             555             560

agc aac tat gat tat gat aca acc cta gat gcc gac aac gaa acg gaa   1728
Ser Asn Tyr Asp Tyr Asp Thr Thr Leu Asp Ala Asp Asn Glu Thr Glu
            565             570             575

cag cgt ttg gat tcc tct gct tat agc tgg gga gag gct gta caa aga   1776
Gln Arg Leu Asp Ser Ser Ala Tyr Ser Trp Gly Glu Ala Val Gln Arg
            580             585             590

cca agt gat gtc acc cct gta aaa ctc tct aaa atc aac taa   1818
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Lys Arg Met Leu Cys Met Ala Leu Val Pro Val Ile Leu Ser Ser Phe
            20                  25                  30


Phe Ala Glu Asp Ala Leu Ala Ser Asn Ser Thr Leu Phe Ala Phe His

            35                  40                  45


Lys Glu Pro Asn Asn Arg Arg Leu Thr Lys Arg Ser Ser Arg Gly Gln
        50                  55                  60


Leu Leu Asn Ser Arg Arg Gly Ser Asp Asp Ala Ser Glu Ser Ser Asp
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Arg Tyr Pro Gly Arg Ser Gly Gly Ser Lys Asn Ser Ser Gln Ser Pro
                85                  90                  95


Trp Ile Lys Tyr Met Gln Lys Phe Asp Ile Pro Arg Asn His Gly Ser
            100                 105                 110


Gly Ile Tyr Val Asp Leu Gly Gly Tyr Glu Ser Val Gly Ser Lys Ser
            115                 120                 125


Tyr Arg Met Pro Val Gly Lys Cys Pro Val Val Gly Lys Ile Ile Asp
    130                 135                 140


Leu Gly Asn Gly Ala Asp Phe Leu Asp Pro Ile Ser Ser Asp Asp Pro
145                 150                 155                 160


Ser Tyr Arg Gly Leu Ala Phe Pro Glu Thr Ala Val Asp Ser Asn Ile
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Pro Thr Gln Pro Lys Thr Arg Gly Ser Ser Ser Ala Ser Ala Ala Lys
            180                 185                 190


Leu Ser Pro Val Ser Ala Lys Asp Leu Arg Arg Trp Gly Tyr Glu Gly
            195                 200                 205


Asn Asp Val Ala Asn Cys Ser Glu Tyr Ala Ser Asn Leu Ile Pro Ala
    210                 215                 220


Ser Asp Arg Ser Thr Lys Tyr Arg Tyr Pro Phe Val Phe Asp Ser Asp
225                 230                 235                 240
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Asn Gln Met Cys Tyr Ile Leu Tyr Ser Ala Ile Gln Tyr Asn Gln Gly
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Asn Arg Tyr Cys Asp Asn Asp Gly Ser Ser Glu Asp Gly Thr Ser Ser
            260             265             270

Leu Leu Cys Met Lys Pro Tyr Lys Ser Ala Glu Asp Ala His Leu Tyr
        275             280             285

Tyr Gly Ser Ala Lys Val Asp Pro Asp Trp Glu Glu Asn Cys Pro Met
    290             295             300

His Pro Val Arg Asp Ala Ile Phe Gly Lys Trp Ser Gly Gly Ser Cys
305             310             315             320

Val Ala Ile Ala Pro Ala Phe Gln Glu Tyr Ala Asn Ser Thr Glu Asp
            325             330             335

Cys Ala Ala Ile Leu Phe Asp Asn Ser Ala Thr Asp Leu Asn Ile Glu
            340             345             350

Ala Val Asn Glu Asp Phe Asn Glu Leu Lys Glu Leu Thr Asp Gly Leu
        355             360             365

Lys Arg Leu Asn Met Ser Lys Val Ala Asn Ala Ile Phe Ser Pro Leu
    370             375             380

Ser Asn Val Ala Gly Thr Ser Arg Ile Ser Arg Gly Val Gly Met Asn
385             390             395             400

Trp Ala Thr Tyr Asp Lys Asp Ser Gly Met Cys Ala Leu Ile Asn Glu
            405             410             415

Thr Pro Asn Cys Leu Ile Leu Asn Ala Gly Ser Ile Ala Leu Thr Ala
            420             425             430

Ile Gly Ser Pro Leu Glu Tyr Asp Ala Val Asn Tyr Pro Cys His Ile
        435             440             445

Asp Thr Asn Gly Tyr Val Glu Pro Arg Ala Lys Asn Thr Asn Lys Tyr
    450             455             460

Leu Asp Val Pro Phe Glu Val Thr Thr Ala Leu Ser Met Lys Thr Leu
465             470             475             480

Lys Cys Asp Ala Tyr Val His Thr Lys Tyr Ser Asp Ser Cys Gly Thr
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                    485                 490                 495

      Tyr Phe Leu Cys Ser Asp Val Lys Pro Asn Trp Phe Ile Arg Phe Leu
              500                 505                 510


      His Met Ile Gly Leu Tyr Asn Thr Lys Arg Ile Val Ile Phe Val Cys
              515                 520                 525


      Cys Thr Thr Thr Ala Ile Val Leu Thr Ile Trp Ile Trp Lys Arg Phe
          530                 535                 540


      Ile Lys Ala Lys Lys Glu Pro Ala Pro Pro Ser Phe Asp Lys Tyr Leu

      545                 550                 555                 560


      Ser Asn Tyr Asp Tyr Asp Thr Thr Leu Asp Ala Asp Asn Glu Thr Glu
                      565                 570                 575


      Gln Arg Leu Asp Ser Ser Ala Tyr Ser Trp Gly Glu Ala Val Gln Arg
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      Pro Ser Asp Val Thr Pro Val Lys Leu Ser Lys Ile Asn
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      1               5                   10                  15

      cct gtg tta gga agc aac tct gac cct tcg gaa gag tat gat tca ttc    96
      Pro Val Leu Gly Ser Asn Ser Asp Pro Ser Glu Glu Tyr Asp Ser Phe
                      20                  25                  30

      cag caa aat gtt ttc act cat caa cca acc caa cta cac aaa tct cat   144
      Gln Gln Asn Val Phe Thr His Gln Pro Thr Gln Leu His Lys Ser His
              35                  40                  45

      cac tac att aca cac cag aaa aaa acc agc caa cac atc gac gat tta   192
      His Tyr Ile Thr His Gln Lys Lys Thr Ser Gln His Ile Asp Asp Leu
          50                  55                  60

      aat ttt tat aat gga aaa ttt aat caa aag agc aga att ggt cca ggg   240
      Asn Phe Tyr Asn Gly Lys Phe Asn Gln Lys Ser Arg Ile Gly Pro Gly
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                 65                      70                      75                      80

        aag gta gta aat aac agt agg aat ctg gta gaa ggt gaa aca cta tct        288
        Lys Val Val Asn Asn Ser Arg Asn Leu Val Glu Gly Glu Thr Leu Ser
                        85                      90                      95

        aag gat gac aat aaa aca aaa tct aaa ata aag tca aaa aca gca tca        336
        Lys Asp Asp Asn Lys Thr Lys Ser Lys Ile Lys Ser Lys Thr Ala Ser
                        100                     105                     110

        att tta cct aga ctt tta aaa tct tta tca ttt tta gct gtt tta ggg        384
        Ile Leu Pro Arg Leu Leu Lys Ser Leu Ser Phe Leu Ala Val Leu Gly
                        115                     120                     125

        tca att aat tca ttt tca tta gca tta gag gaa cct ttt act caa cac        432
        Ser Ile Asn Ser Phe Ser Leu Ala Leu Glu Glu Pro Phe Thr Gln His
            130                     135                     140

        act tct aac cga acg ccc ttt gaa gta tca tta att caa agc aac agc        480
        Thr Ser Asn Arg Thr Pro Phe Glu Val Ser Leu Ile Gln Ser Asn Ser
        145                     150                     155                     160

        agt tta tcg cct att cat aat tct tca act caa aat tca agt cat cac        528
        Ser Leu Ser Pro Ile His Asn Ser Ser Thr Gln Asn Ser Ser His His
                        165                     170                     175

        aac ggt ttt agt ggt agt acc gtt aat aat acc tca tta ata gag aca        576
        Asn Gly Phe Ser Gly Ser Thr Val Asn Asn Thr Ser Leu Ile Glu Thr
                        180                     185                     190

        agg aat aac gta tta aac aga aca cta ggt aga ttc gga tca ttt ttg        624
        Arg Asn Asn Val Leu Asn Arg Thr Leu Gly Arg Phe Gly Ser Phe Leu
                        195                     200                     205

        caa tca gga ttg ata agc agt aga gca gac aaa aag aag cgg tct ggt        672
        Gln Ser Gly Leu Ile Ser Ser Arg Ala Asp Lys Lys Lys Arg Ser Gly
            210                     215                     220

        atg aat aga aga ggc cct aag ggg aag aaa ggg aag gga gga gaa gac        720
        Met Asn Arg Arg Gly Pro Lys Gly Lys Lys Gly Lys Gly Gly Glu Asp
        225                     230                     235                     240

        gaa gaa aag agg aac aag tgg acc gat ttc atg gca aag ttt gat atc        768
        Glu Glu Lys Arg Asn Lys Trp Thr Asp Phe Met Ala Lys Phe Asp Ile
                        245                     250                     255

        gct aag gtc cac ggt tca ggg gtt tac gta gat ttg ggt gaa tct gcc        816
        Ala Lys Val His Gly Ser Gly Val Tyr Val Asp Leu Gly Glu Ser Ala
                        260                     265                     270

        acc gtt ggc agt tat gac tac agg atg cct ata gga aaa tgt cca gtt        864
        Thr Val Gly Ser Tyr Asp Tyr Arg Met Pro Ile Gly Lys Cys Pro Val
                        275                     280                     285

        gta ggt aag gca atc ata ctc gag aat gga gct gat ttt ttg agc agc        912
        Val Gly Lys Ala Ile Ile Leu Glu Asn Gly Ala Asp Phe Leu Ser Ser
                        290                     295                     300

        ata acc cat cat gac ccc aag gag aga ggg ctg ggg ttc cct gct aca        960
        Ile Thr His His Asp Pro Lys Glu Arg Gly Leu Gly Phe Pro Ala Thr
        305                     310                     315                     320
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aaa gtt gcc tca aat tca tca aaa ctg gac atg gag aac cag ctc tta     1008
Lys Val Ala Ser Asn Ser Ser Lys Leu Asp Met Glu Asn Gln Leu Leu
                325             330             335

tca cca att agt gct cag gtc cta agg agc tgg aat tat aaa cac gaa     1056
Ser Pro Ile Ser Ala Gln Val Leu Arg Ser Trp Asn Tyr Lys His Glu
                340             345             350

tca gat tta agt aat tgt gct gag tat tcg aga aac att gtt ccg ggc     1104
Ser Asp Leu Ser Asn Cys Ala Glu Tyr Ser Arg Asn Ile Val Pro Gly
                355             360             365

agt aat cgt aat tca aag tat cgt tac ccg ttt gta tat gat gag tct     1152
Ser Asn Arg Asn Ser Lys Tyr Arg Tyr Pro Phe Val Tyr Asp Glu Ser
        370             375             380

gag aag ctt tgt tat att tta tat agt ccc atg caa tat aat cag ggc     1200
Glu Lys Leu Cys Tyr Ile Leu Tyr Ser Pro Met Gln Tyr Asn Gln Gly
385             390             395             400

gta aag tac tgt gac caa gac tct ccg gac gaa gga act agc agt tta     1248
Val Lys Tyr Cys Asp Gln Asp Ser Pro Asp Glu Gly Thr Ser Ser Leu
                405             410             415

gct tgt atg tac ccg gat aag agc aag gag gat tca cac cta ttt tac     1296
Ala Cys Met Tyr Pro Asp Lys Ser Lys Glu Asp Ser His Leu Phe Tyr
                420             425             430

gga acc agc ggt ctt cac atg gac tgg cct gta gtt tgc cca gtt tac     1344
Gly Thr Ser Gly Leu His Met Asp Trp Pro Val Val Cys Pro Val Tyr
                435             440             445

cct att aga gat tcg att ttt gga tcc tac gac gac caa aag gac gaa     1392
Pro Ile Arg Asp Ser Ile Phe Gly Ser Tyr Asp Asp Gln Lys Asp Glu
        450             455             460

tgt gtt cca att gag ccg ata ttt gag gag gag gct gaa gat tat gag     1440
Cys Val Pro Ile Glu Pro Ile Phe Glu Glu Glu Ala Glu Asp Tyr Glu
465             470             475             480

gca tgt gcc aag ata att ttc gag tat tct cca agt gat gtt gat att     1488
Ala Cys Ala Lys Ile Ile Phe Glu Tyr Ser Pro Ser Asp Val Asp Ile
                485             490             495

agc aca aat aac cag aag ctt tca gac gtc gac ctt tac aag gag gcg     1536
Ser Thr Asn Asn Gln Lys Leu Ser Asp Val Asp Leu Tyr Lys Glu Ala
                500             505             510

atg aat aat gga aag ctg agc act gct ctt tca att atg ttt gct cct     1584
Met Asn Asn Gly Lys Leu Ser Thr Ala Leu Ser Ile Met Phe Ala Pro
                515             520             525

agg tac tct gag gat cgt ccg atc tat act aaa ggt gtc ggt ata aac     1632
Arg Tyr Ser Glu Asp Arg Pro Ile Tyr Thr Lys Gly Val Gly Ile Asn
                530             535             540

tgg gct aca tac tcc gtc gag gaa aag aaa tgt aac att ctc gac gtt     1680
Trp Ala Thr Tyr Ser Val Glu Glu Lys Lys Cys Asn Ile Leu Asp Val
545             550             555             560
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gtt ccc agc tgt ctt att ata agt aac ggc cac tat gcc ctt aca agt          1728
Val Pro Ser Cys Leu Ile Ile Ser Asn Gly His Tyr Ala Leu Thr Ser
            565                 570                 575

ctc agc tca ccc aat gaa gag gat gct ata aat tac ccc tgc gat atc          1776
Leu Ser Ser Pro Asn Glu Glu Asp Ala Ile Asn Tyr Pro Cys Asp Ile
            580                 585                 590

gtt cag ggc aag ggg ttt ttg aag aac cca aac ggt gga aaa aag aat          1824
Val Gln Gly Lys Gly Phe Leu Lys Asn Pro Asn Gly Gly Lys Lys Asn
            595                 600                 605

gct cag gaa ccg ccc aag gaa cct gaa cct gaa gaa cct aag aag gag          1872
Ala Gln Glu Pro Pro Lys Glu Pro Glu Pro Glu Glu Pro Lys Lys Glu
    610                 615                 620

ggt gct gaa aac aaa ccc aaa gag aaa ggt aaa tct gag aaa aag aat          1920
Gly Ala Glu Asn Lys Pro Lys Glu Lys Gly Lys Ser Glu Lys Lys Asn
625                 630                 635                 640

gaa aaa tct atg cct tca gga cca ttc acg cca tac act agc ttg aag          1968
Glu Lys Ser Met Pro Ser Gly Pro Phe Thr Pro Tyr Thr Ser Leu Lys
            645                 650                 655

aag gag ggt ttc gag tgc agt aaa tac act gtt gag cgg gtg aac aaa          2016
Lys Glu Gly Phe Glu Cys Ser Lys Tyr Thr Val Glu Arg Val Asn Lys
            660                 665                 670

agc tgc ggc gtt tac tat gaa tgc tca gaa acg cct gta tta ttt acc          2064
Ser Cys Gly Val Tyr Tyr Glu Cys Ser Glu Thr Pro Val Leu Phe Thr
            675                 680                 685

aag aag aat agg att tat cta tac atc ata ttg gca gta tcg ctt gta          2112
Lys Lys Asn Arg Ile Tyr Leu Tyr Ile Ile Leu Ala Val Ser Leu Val
            690                 695                 700

gta ctg gcc gtc tta gcc tac ttt gga tac agg tac tac agt aag aat          2160
Val Leu Ala Val Leu Ala Tyr Phe Gly Tyr Arg Tyr Tyr Ser Lys Asn
705                 710                 715                 720

cac ttg aaa aaa cac aat tcc cag ata tat gaa gat gat aac gtg aac          2208
His Leu Lys Lys His Asn Ser Gln Ile Tyr Glu Asp Asp Asn Val Asn
                725                 730                 735

aac tac tac aat gag gac ttt gat gac gaa caa gat cgg gat gaa tac          2256
Asn Tyr Tyr Asn Glu Asp Phe Asp Asp Glu Gln Asp Arg Asp Glu Tyr
            740                 745                 750

gct tcg aat gtt aga ggt gat caa atc tgg agc aga cac act cca gac          2304
Ala Ser Asn Val Arg Gly Asp Gln Ile Trp Ser Arg His Thr Pro Asp
            755                 760                 765

aga tct gaa gtt act cca gtc aga atc tct agg tta aac cat taa          2349
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Gln Gln Asn Val Phe Thr His Gln Pro Thr Gln Leu His Lys Ser His
        35   40   45

His Tyr Ile Thr His Gln Lys Lys Thr Ser Gln His Ile Asp Asp Leu
    50   55   60

Asn Phe Tyr Asn Gly Lys Phe Asn Gln Lys Ser Arg Ile Gly Pro Gly
65   70   75   80

Lys Val Val Asn Asn Ser Arg Asn Leu Val Glu Gly Glu Thr Leu Ser
            85   90   95

Lys Asp Asp Asn Lys Thr Lys Ser Lys Ile Lys Ser Lys Thr Ala Ser
        100   105   110

Ile Leu Pro Arg Leu Leu Lys Ser Leu Ser Phe Leu Ala Val Leu Gly
        115   120   125

Ser Ile Asn Ser Phe Ser Leu Ala Leu Glu Glu Pro Phe Thr Gln His   .
    130   135   140

Thr Ser Asn Arg Thr Pro Phe Glu Val Ser Leu Ile Gln Ser Asn Ser
145   150   155   160

Ser Leu Ser Pro Ile His Asn Ser Ser Thr Gln Asn Ser Ser His His
            165   170   175

Asn Gly Phe Ser Gly Ser Thr Val Asn Asn Thr Ser Leu Ile Glu Thr
            180   185   190

Arg Asn Asn Val Leu Asn Arg Thr Leu Gly Arg Phe Gly Ser Phe Leu
        195   200   205

Gln Ser Gly Leu Ile Ser Ser Arg Ala Asp Lys Lys Lys Arg Ser Gly
    210   215   220

Met Asn Arg Arg Gly Pro Lys Gly Lys Lys Gly Lys Gly Gly Glu Asp

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        225                230                235                240


        Glu Glu Lys Arg Asn Lys Trp Thr Asp Phe Met Ala Lys Phe Asp Ile
                        245                250                255


        Ala Lys Val His Gly Ser Gly Val Tyr Val Asp Leu Gly Glu Ser Ala
                        260                265                270


        Thr Val Gly Ser Tyr Asp Tyr Arg Met Pro Ile Gly Lys Cys Pro Val
                275                280                285


        Val Gly Lys Ala Ile Ile Leu Glu Asn Gly Ala Asp Phe Leu Ser Ser
                290                295                300


        Ile Thr His His Asp Pro Lys Glu Arg Gly Leu Gly Phe Pro Ala Thr
        305                310                315                320


        Lys Val Ala Ser Asn Ser Ser Lys Leu Asp Met Glu Asn Gln Leu Leu
                        325                330                335


        Ser Pro Ile Ser Ala Gln Val Leu Arg Ser Trp Asn Tyr Lys His Glu
                        340                345                350


        Ser Asp Leu Ser Asn Cys Ala Glu Tyr Ser Arg Asn Ile Val Pro Gly
                355                360                365


        Ser Asn Arg Asn Ser Lys Tyr Arg Tyr Pro Phe Val Tyr Asp Glu Ser
                370                375                380


        Glu Lys Leu Cys Tyr Ile Leu Tyr Ser Pro Met Gln Tyr Asn Gln Gly
        385                390                395                400


        Val Lys Tyr Cys Asp Gln Asp Ser Pro Asp Glu Gly Thr Ser Ser Leu
                        405                410                415


        Ala Cys Met Tyr Pro Asp Lys Ser Lys Glu Asp Ser His Leu Phe Tyr
                        420                425                430


        Gly Thr Ser Gly Leu His Met Asp Trp Pro Val Val Cys Pro Val Tyr
                435                440                445


        Pro Ile Arg Asp Ser Ile Phe Gly Ser Tyr Asp Asp Gln Lys Asp Glu
                450                455                460


        Cys Val Pro Ile Glu Pro Ile Phe Glu Glu Glu Ala Glu Asp Tyr Glu
        465                470                475                480
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Ala Cys Ala Lys Ile Ile Phe Glu Tyr Ser Pro Ser Asp Val Asp Ile
             485               490               495


Ser Thr Asn Asn Gln Lys Leu Ser Asp Val Asp Leu Tyr Lys Glu Ala
             500               505               510


Met Asn Asn Gly Lys Leu Ser Thr Ala Leu Ser Ile Met Phe Ala Pro
             515               520               525


Arg Tyr Ser Glu Asp Arg Pro Ile Tyr Thr Lys Gly Val Gly Ile Asn
     530               535               540


Trp Ala Thr Tyr Ser Val Glu Glu Lys Lys Cys Asn Ile Leu Asp Val
545               550               555               560


Val Pro Ser Cys Leu Ile Ile Ser Asn Gly His Tyr Ala Leu Thr Ser
             565               570               575


Leu Ser Ser Pro Asn Glu Glu Asp Ala Ile Asn Tyr Pro Cys Asp Ile
             580               585               590


Val Gln Gly Lys Gly Phe Leu Lys Asn Pro Asn Gly Gly Lys Lys Asn
     595               600               605


Ala Gln Glu Pro Pro Lys Glu Pro Glu Pro Glu Glu Pro Lys Lys Glu
     610               615               620


Gly Ala Glu Asn Lys Pro Lys Glu Lys Gly Lys Ser Glu Lys Lys Asn
625               630               635               640


Glu Lys Ser Met Pro Ser Gly Pro Phe Thr Pro Tyr Thr Ser Leu Lys
             645               650               655


Lys Glu Gly Phe Glu Cys Ser Lys Tyr Thr Val Glu Arg Val Asn Lys
             660               665               670


Ser Cys Gly Val Tyr Tyr Glu Cys Ser Glu Thr Pro Val Leu Phe Thr
             675               680               685


Lys Lys Asn Arg Ile Tyr Leu Tyr Ile Ile Leu Ala Val Ser Leu Val
     690               695               700


Val Leu Ala Val Leu Ala Tyr Phe Gly Tyr Arg Tyr Tyr Ser Lys Asn
705               710               715               720
```

```
His Leu Lys Lys His Asn Ser Gln Ile Tyr Glu Asp Asp Asn Val Asn
              725                 730                 735

Asn Tyr Tyr Asn Glu Asp Phe Asp Asp Glu Gln Asp Arg Asp Glu Tyr
              740                 745                 750

Ala Ser Asn Val Arg Gly Asp Gln Ile Trp Ser Arg His Thr Pro Asp
              755                 760                 765

Arg Ser Glu Val Thr Pro Val Arg Ile Ser Arg Leu Asn His
        770                 775                 780


<210>   5
<211>   1968
<212>   DNA
<213>   Babesia bovis


<220>
<221>   CDS
<222>   (1)..(1968)

<400>   5
atg atc ggt tac atc aag att ctg gcc tct gtg ccc ctg tta agt tta      48
Met Ile Gly Tyr Ile Lys Ile Leu Ala Ser Val Pro Leu Leu Ser Leu
1               5                   10                  15

gcc ttt tta gct aca acg ggg ata cat gct ttt gcg gac aaa ggt att      96
Ala Phe Leu Ala Thr Thr Gly Ile His Ala Phe Ala Asp Lys Gly Ile
                20                  25                  30

ggt tca cca aag ggg aaa caa tgc aag aag caa ctt gac ttt tcg att     144
Gly Ser Pro Lys Gly Lys Gln Cys Lys Lys Gln Leu Asp Phe Ser Ile
            35                  40                  45

gtg gta gat gaa tct gct agt ata tcg gat gat caa tgg gag ggt cag     192
Val Val Asp Glu Ser Ala Ser Ile Ser Asp Asp Gln Trp Glu Gly Gln
        50                  55                  60

atg att cca ttt ttg agg aat ttg att cat acc gtt gac ctt gac aac     240
Met Ile Pro Phe Leu Arg Asn Leu Ile His Thr Val Asp Leu Asp Asn
65                  70                  75                  80

act gac ata cgt ctt tcg ctt acc act tac tca act cca act cgc cag     288
Thr Asp Ile Arg Leu Ser Leu Thr Thr Tyr Ser Thr Pro Thr Arg Gln
                85                  90                  95

ata ttt acg ttt ttg gat gct gct gca agc agt acc agg ctc gca ctc     336
Ile Phe Thr Phe Leu Asp Ala Ala Ala Ser Ser Thr Arg Leu Ala Leu
                100                 105                 110

acg aaa ctt gat tgg atg aac ggt acc aaa gct agg tat ggt atg acc     384
Thr Lys Leu Asp Trp Met Asn Gly Thr Lys Ala Arg Tyr Gly Met Thr
            115                 120                 125
```

```
tac act ggc agg gct ctg aac tac gtt cgt aag gct ata cta cca tat      432
Tyr Thr Gly Arg Ala Leu Asn Tyr Val Arg Lys Ala Ile Leu Pro Tyr
    130             135             140

ggt cgc aag aat gta ccc aag gca ctg tta ctg atc act gat gga gta      480
Gly Arg Lys Asn Val Pro Lys Ala Leu Leu Leu Ile Thr Asp Gly Val
145             150             155             160

tct tcg gat gga agt tac act gca cag gtt gcg gct atg ctt cgt gat      528
Ser Ser Asp Gly Ser Tyr Thr Ala Gln Val Ala Ala Met Leu Arg Asp
            165             170             175

gaa ggt gta aat gta atg gtt att ggt gtc ggt gat gta aat gtt gct      576
Glu Gly Val Asn Val Met Val Ile Gly Val Gly Asp Val Asn Val Ala
            180             185             190

gaa tgc cgt ggc ata gta gga tgt gat gga ata atg gat tgt cct atg      624
Glu Cys Arg Gly Ile Val Gly Cys Asp Gly Ile Met Asp Cys Pro Met
        195             200             205

ttc aag cag acc aac tgg aag gat atc atg ggc ctc ttt aac agt tta      672
Phe Lys Gln Thr Asn Trp Lys Asp Ile Met Gly Leu Phe Asn Ser Leu
    210             215             220

atg aag gag gta tgt gat att tta cct cag gac gct gtt tgt gag cct      720
Met Lys Glu Val Cys Asp Ile Leu Pro Gln Asp Ala Val Cys Glu Pro
225             230             235             240

gta tgg gca gaa tgg tca tct tgt aac ggg gaa tgt ggc gtt cct ggt      768
Val Trp Ala Glu Trp Ser Ser Cys Asn Gly Glu Cys Gly Val Pro Gly
            245             250             255

aaa cga act cgt gct ctt ttg gac ctc cga atg att gaa aag ccc gta      816
Lys Arg Thr Arg Ala Leu Leu Asp Leu Arg Met Ile Glu Lys Pro Val
        260             265             270

aat ggc tcg aat gga caa ccg ggt aaa tca tgt gag gat cag aag atg      864
Asn Gly Ser Asn Gly Gln Pro Gly Lys Ser Cys Glu Asp Gln Lys Met
        275             280             285

aac ttc tta ccc caa tca gag aca tgc acc ata gaa tgc aat cat gag      912
Asn Phe Leu Pro Gln Ser Glu Thr Cys Thr Ile Glu Cys Asn His Glu
    290             295             300

cct gtg cca agc tcg ccg gaa cct gta tca gat gat atg gat cac cca      960
Pro Val Pro Ser Ser Pro Glu Pro Val Ser Asp Asp Met Asp His Pro
305             310             315             320

gaa cca act cct gtt aca ccg gaa ggt gac atg gat aaa tct cat tcc     1008
Glu Pro Thr Pro Val Thr Pro Glu Gly Asp Met Asp Lys Ser His Ser
            325             330             335

cat tcg agc att cca tcc acc cct gat atg cca tca agt cac agt gat     1056
His Ser Ser Ile Pro Ser Thr Pro Asp Met Pro Ser Ser His Ser Asp
            340             345             350

atg tca tca agc cct act gat atg tca tca agc cct act gac atg tca     1104
Met Ser Ser Ser Pro Thr Asp Met Ser Ser Ser Pro Thr Asp Met Ser
            355             360             365

tca agc cct act gac atg tca tca agt cac agt gac atg cca tca act     1152
```

```
                Ser Ser Pro Thr Asp Met Ser Ser Ser His Ser Asp Met Pro Ser Thr
                    370                 375             380

cct act ggc atg tca tca agt cac agt gat atg cca tca agt cac agt                1200
Pro Thr Gly Met Ser Ser Ser His Ser Asp Met Pro Ser Ser His Ser
385                 390                 395                 400

gat atg cca tca agc cac agt gat atg tca tca agc cct act gac atg                1248
Asp Met Pro Ser Ser His Ser Asp Met Ser Ser Ser Pro Thr Asp Met
                    405                 410                 415

tca tca agt cac gct gat act cgt gta gga aat acc gat gaa gaa cat                1296
Ser Ser Ser His Ala Asp Thr Arg Val Gly Asn Thr Asp Glu Glu His
                420                 425                 430

aac cac agg aaa gat atg gat gtc aag ttc ccc gaa aat atg gat gat                1344
Asn His Arg Lys Asp Met Asp Val Lys Phe Pro Glu Asn Met Asp Asp
            435                 440                 445

atc cca gtc gag gat aat cct ata ccc aca gat cct aga cat ggc gtc                1392
Ile Pro Val Glu Asp Asn Pro Ile Pro Thr Asp Pro Arg His Gly Val
    450                 455                 460

gaa cca tcg cct tct gat gtg atc cct gag gat gac caa ctt cgt agg                1440
Glu Pro Ser Pro Ser Asp Val Ile Pro Glu Asp Asp Gln Leu Arg Arg
465                 470                 475                 480

acg ctt gaa atg cag cgc gaa gag gac cta aag aag gaa ttg atg ctc                1488
Thr Leu Glu Met Gln Arg Glu Glu Asp Leu Lys Lys Glu Leu Met Leu
                485                 490                 495

caa cat gaa ctg aag ctt cag gaa gaa aag gaa agg gca gct att tta                1536
Gln His Glu Leu Lys Leu Gln Glu Glu Lys Glu Arg Ala Ala Ile Leu
            500                 505                 510

gag aat aac act cct tat gga tcc gcc act tcc gtg tcg caa gac ggt                1584
Glu Asn Asn Thr Pro Tyr Gly Ser Ala Thr Ser Val Ser Gln Asp Gly
        515                 520                 525

gaa tct cca act ggc gta ccc caa agt agc gag acc gat gca ata cgt                1632
Glu Ser Pro Thr Gly Val Pro Gln Ser Ser Glu Thr Asp Ala Ile Arg
    530                 535                 540

cac gag gtg tat gac gat cac ccc gag gaa tct gaa aac acc ggg att                1680
His Glu Val Tyr Asp Asp His Pro Glu Glu Ser Glu Asn Thr Gly Ile
545                 550                 555                 560

aat gct gat gtg acc gaa tct gag gac tat gag ggt gaa aaa caa aag                1728
Asn Ala Asp Val Thr Glu Ser Glu Asp Tyr Glu Gly Glu Lys Gln Lys
                565                 570                 575

gac gaa tca aat gaa cgt tcg acc agc aac act act aag att gcc ggc                1776
Asp Glu Ser Asn Glu Arg Ser Thr Ser Asn Thr Thr Lys Ile Ala Gly
            580                 585                 590

ggt gct cta cta ggt ctt ctt ctc ctt ggt gcc ggt ggt gga tac gct                1824
Gly Ala Leu Leu Gly Leu Leu Leu Leu Gly Ala Gly Gly Gly Tyr Ala
        595                 600                 605

atg tac aaa aag aac aag aca cct act gtt gag aca ggt tca ggt gat                1872
Met Tyr Lys Lys Asn Lys Thr Pro Thr Val Glu Thr Gly Ser Gly Asp
```

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                610                    615                    620
tac act ggg gcc gac gag agt tca gaa ccc atg aag gag ggt gac aca      1920
Tyr Thr Gly Ala Asp Glu Ser Ser Glu Pro Met Lys Glu Gly Asp Thr
625                  630                    635                    640

tac acc gtc act gag ttt gac aac aac att tgg ggc gag gca gcg taa      1968
Tyr Thr Val Thr Glu Phe Asp Asn Asn Ile Trp Gly Glu Ala Ala
                   645                    650                    655
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<210> 6
<211> 655
<212> PRT
<213> Babesia bovis

<400> 6

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Met Ile Gly Tyr Ile Lys Ile Leu Ala Ser Val Pro Leu Leu Ser Leu
1               5                   10                  15


Ala Phe Leu Ala Thr Thr Gly Ile His Ala Phe Ala Asp Lys Gly Ile
            20                  25                  30


Gly Ser Pro Lys Gly Lys Gln Cys Lys Lys Gln Leu Asp Phe Ser Ile
        35                  40                  45


Val Val Asp Glu Ser Ala Ser Ile Ser Asp Asp Gln Trp Glu Gly Gln
    50                  55                  60


Met Ile Pro Phe Leu Arg Asn Leu Ile His Thr Val Asp Leu Asp Asn
65                  70                  75                  80


Thr Asp Ile Arg Leu Ser Leu Thr Thr Tyr Ser Thr Pro Thr Arg Gln
                85                  90                  95


Ile Phe Thr Phe Leu Asp Ala Ala Ala Ser Ser Thr Arg Leu Ala Leu
            100                 105                 110


Thr Lys Leu Asp Trp Met Asn Gly Thr Lys Ala Arg Tyr Gly Met Thr
        115                 120                 125


Tyr Thr Gly Arg Ala Leu Asn Tyr Val Arg Lys Ala Ile Leu Pro Tyr
    130                 135                 140


Gly Arg Lys Asn Val Pro Lys Ala Leu Leu Leu Ile Thr Asp Gly Val
145                 150                 155                 160


Ser Ser Asp Gly Ser Tyr Thr Ala Gln Val Ala Ala Met Leu Arg Asp
                165                 170                 175
```

```
Glu Gly Val Asn Val Met Val Ile Gly Val Gly Asp Val Asn Val Ala
        180             185             190

Glu Cys Arg Gly Ile Val Gly Cys Asp Gly Ile Met Asp Cys Pro Met
        195             200             205

Phe Lys Gln Thr Asn Trp Lys Asp Ile Met Gly Leu Phe Asn Ser Leu
        210             215             220

Met Lys Glu Val Cys Asp Ile Leu Pro Gln Asp Ala Val Cys Glu Pro
225             230             235             240

Val Trp Ala Glu Trp Ser Ser Cys Asn Gly Glu Cys Gly Val Pro Gly
            245             250             255

Lys Arg Thr Arg Ala Leu Leu Asp Leu Arg Met Ile Glu Lys Pro Val
        260             265             270

Asn Gly Ser Asn Gly Gln Pro Gly Lys Ser Cys Glu Asp Gln Lys Met
        275             280             285

Asn Phe Leu Pro Gln Ser Glu Thr Cys Thr Ile Glu Cys Asn His Glu
        290             295             300

Pro Val Pro Ser Ser Pro Glu Pro Val Ser Asp Asp Met Asp His Pro
305             310             315             320

Glu Pro Thr Pro Val Thr Pro Glu Gly Asp Met Asp Lys Ser His Ser
            325             330             335

His Ser Ser Ile Pro Ser Thr Pro Asp Met Pro Ser Ser His Ser Asp
            340             345             350

Met Ser Ser Ser Pro Thr Asp Met Ser Ser Ser Pro Thr Asp Met Ser
        355             360             365

Ser Ser Pro Thr Asp Met Ser Ser Ser His Ser Asp Met Pro Ser Thr
    370             375             380

Pro Thr Gly Met Ser Ser Ser His Ser Asp Met Pro Ser Ser His Ser
385             390             395             400

Asp Met Pro Ser Ser His Ser Asp Met Ser Ser Ser Pro Thr Asp Met
            405             410             415
```

```
Ser Ser Ser His Ala Asp Thr Arg Val Gly Asn Thr Asp Glu Glu His
        420             425             430


Asn His Arg Lys Asp Met Asp Val Lys Phe Pro Glu Asn Met Asp Asp
        435             440             445


Ile Pro Val Glu Asp Asn Pro Ile Pro Thr Asp Pro Arg His Gly Val
    450             455             460


Glu Pro Ser Pro Ser Asp Val Ile Pro Glu Asp Asp Gln Leu Arg Arg
465             470             475             480


Thr Leu Glu Met Gln Arg Glu Glu Asp Leu Lys Lys Glu Leu Met Leu
            485             490             495


Gln His Glu Leu Lys Leu Gln Glu Glu Lys Glu Arg Ala Ala Ile Leu
        500             505             510


Glu Asn Asn Thr Pro Tyr Gly Ser Ala Thr Ser Val Ser Gln Asp Gly
        515             520             525


Glu Ser Pro Thr Gly Val Pro Gln Ser Ser Glu Thr Asp Ala Ile Arg
    530             535             540


His Glu Val Tyr Asp Asp His Pro Glu Glu Ser Glu Asn Thr Gly Ile
545             550             555             560


Asn Ala Asp Val Thr Glu Ser Glu Asp Tyr Glu Gly Glu Lys Gln Lys
            565             570             575


Asp Glu Ser Asn Glu Arg Ser Thr Ser Asn Thr Thr Lys Ile Ala Gly
        580             585             590


Gly Ala Leu Leu Gly Leu Leu Leu Leu Gly Ala Gly Gly Gly Tyr Ala
        595             600             605


Met Tyr Lys Lys Asn Lys Thr Pro Thr Val Glu Thr Gly Ser Gly Asp
    610             615             620


Tyr Thr Gly Ala Asp Glu Ser Ser Glu Pro Met Lys Glu Gly Asp Thr
625             630             635             640


Tyr Thr Val Thr Glu Phe Asp Asn Asn Ile Trp Gly Glu Ala Ala
            645             650             655
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<210>   7
<211>   1047
<212>   DNA
<213>   Theileria annulata


<220>
<221>   CDS
<222>   (1)..(1047)


<400>   7
gat aag ggg cta tat cct gac ggt ata aag aaa ccg agc tcc tac tgc      48
Asp Lys Gly Leu Tyr Pro Asp Gly Ile Lys Lys Pro Ser Ser Tyr Cys
1               5                   10                  15

cac agg gaa ttg gac tta aca ata tta gtc gat gaa tcc tcg agt atc      96
His Arg Glu Leu Asp Leu Thr Ile Leu Val Asp Glu Ser Ser Ser Ile
                20                  25                  30

tat att gaa gag tgg aac aaa ctc att cca ttt ctt aaa tca ctg gtg     144
Tyr Ile Glu Glu Trp Asn Lys Leu Ile Pro Phe Leu Lys Ser Leu Val
            35                  40                  45

aga tca ata aat ata agt cca aat tat gtg cac ttg tca atg gtc acc     192
Arg Ser Ile Asn Ile Ser Pro Asn Tyr Val His Leu Ser Met Val Thr
        50                  55                  60

ttt tcc act tca att cgg tgg tta ata tca ttt ctc gac cca gcc tct     240
Phe Ser Thr Ser Ile Arg Trp Leu Ile Ser Phe Leu Asp Pro Ala Ser
65                  70                  75                  80

aag gat gag caa ttg gcc ctt gct gtt ctg gac aag ctg aag aac agt     288
Lys Asp Glu Gln Leu Ala Leu Ala Val Leu Asp Lys Leu Lys Asn Ser
                85                  90                  95

aag cct gtg ttt ggg tac aca ttc act gga cag gca ctt aac ttt att     336
Lys Pro Val Phe Gly Tyr Thr Phe Thr Gly Gln Ala Leu Asn Phe Ile
                100                 105                 110

tct gag gct gtt tat atg ttt ggt gct agg cgt aac tct cca aag ggc     384
Ser Glu Ala Val Tyr Met Phe Gly Ala Arg Arg Asn Ser Pro Lys Gly
            115                 120                 125

atc att atc atc acc gac gga tcc tct act cag aca aac gtt act tct     432
Ile Ile Ile Ile Thr Asp Gly Ser Ser Thr Gln Thr Asn Val Thr Ser
        130                 135                 140

cag gcg tcg gct cta cta agg gat gct ggt gta aca att cta gtt gtt     480
Gln Ala Ser Ala Leu Leu Arg Asp Ala Gly Val Thr Ile Leu Val Val
145                 150                 155                 160

gga gtt ggg aag gct aaa gaa agc gag tgt aga ggt ata gtt ggt tgt     528
Gly Val Gly Lys Ala Lys Glu Ser Glu Cys Arg Gly Ile Val Gly Cys
                165                 170                 175

tct acc aaa gga gag tgc ccc ctt ttc ttt atg acc aac tgg gat gaa     576
Ser Thr Lys Gly Glu Cys Pro Leu Phe Phe Met Thr Asn Trp Asp Glu
                180                 185                 190

att atc agg aag gtt ggg gag ttg atg gct gag gtt tgt gag acc att     624
Ile Ile Arg Lys Val Gly Glu Leu Met Ala Glu Val·Cys Glu Thr Ile
```

```
          195                   200                   205

cct aag gac gcc gta tgt aag ccg atc tgg tct gat tgg tct aag tgt    672
Pro Lys Asp Ala Val Cys Lys Pro Ile Trp Ser Asp Trp Ser Lys Cys
    210                   215                   220

gac gcc aag tgc ggc att ggg acg agg tac caa aag ttg atg gga gtt    720
Asp Ala Lys Cys Gly Ile Gly Thr Arg Tyr Gln Lys Leu Met Gly Val
225                   230                   235                   240

act aca att tct gag cca act gtc gga acg aac ggc aag tcc ggg agg    768
Thr Thr Ile Ser Glu Pro Thr Val Gly Thr Asn Gly Lys Ser Gly Arg
                245                   250                   255

aca tgt gag atg att tat gag aac gtc gag gtt cca aag gag gag tgc    816
Thr Cys Glu Met Ile Tyr Glu Asn Val Glu Val Pro Lys Glu Glu Cys
                260                   265                   270

tcc gtt gag tct aag att gct gga gga gtg gct cta gca ctg tta atg    864
Ser Val Glu Ser Lys Ile Ala Gly Gly Val Ala Leu Ala Leu Leu Met
                275                   280                   285

ctt gca ggc gga ggt ggt tac aca tac tac aaa aag tac ggt tta tct    912
Leu Ala Gly Gly Gly Gly Tyr Thr Tyr Tyr Lys Lys Tyr Gly Leu Ser
    290                   295                   300

aga gtg agt gaa act acg aat ttg gat gag gat ttt gca gat tct agt    960
Arg Val Ser Glu Thr Thr Asn Leu Asp Glu Asp Phe Ala Asp Ser Ser
305                   310                   315                   320

ggg aac cgt ggt gta agg gag agt gtg ggt gaa gct tac aca gta act    1008
Gly Asn Arg Gly Val Arg Glu Ser Val Gly Glu Ala Tyr Thr Val Thr
                325                   330                   335

gat tta gat gat gga ctc tgg agc caa tcc aat caa taa    1047
Asp Leu Asp Asp Gly Leu Trp Ser Gln Ser Asn Gln
                340                   345
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<210>    8
<211>    348
<212>    PRT
<213>    Theileria annulata

<400>    8
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Asp Lys Gly Leu Tyr Pro Asp Gly Ile Lys Lys Pro Ser Ser Tyr Cys
1                5                   10                  15


His Arg Glu Leu Asp Leu Thr Ile Leu Val Asp Glu Ser Ser Ser Ile
            20                  25                  30


Tyr Ile Glu Glu Trp Asn Lys Leu Ile Pro Phe Leu Lys Ser Leu Val
            35                  40                  45


Arg Ser Ile Asn Ile Ser Pro Asn Tyr Val His Leu Ser Met Val Thr
        50                  55                  60
```

```
Phe Ser Thr Ser Ile Arg Trp Leu Ile Ser Phe Leu Asp Pro Ala Ser
65              70              75              80


Lys Asp Glu Gln Leu Ala Leu Ala Val Leu Asp Lys Leu Lys Asn Ser
            85              90              95


Lys Pro Val Phe Gly Tyr Thr Phe Thr Gly Gln Ala Leu Asn Phe Ile
            100             105             110


Ser Glu Ala Val Tyr Met Phe Gly Ala Arg Arg Asn Ser Pro Lys Gly
        115             120             125


Ile Ile Ile Ile Thr Asp Gly Ser Ser Thr Gln Thr Asn Val Thr Ser
    130             135             140


Gln Ala Ser Ala Leu Leu Arg Asp Ala Gly Val Thr Ile Leu Val Val
145             150             155             160


Gly Val Gly Lys Ala Lys Glu Ser Glu Cys Arg Gly Ile Val Gly Cys
            165             170             175


Ser Thr Lys Gly Glu Cys Pro Leu Phe Phe Met Thr Asn Trp Asp Glu
            180             185             190


Ile Ile Arg Lys Val Gly Glu Leu Met Ala Glu Val Cys Glu Thr Ile
            195             200             205


Pro Lys Asp Ala Val Cys Lys Pro Ile Trp Ser Asp Trp Ser Lys Cys
    210             215             220


Asp Ala Lys Cys Gly Ile Gly Thr Arg Tyr Gln Lys Leu Met Gly Val
225             230             235             240


Thr Thr Ile Ser Glu Pro Thr Val Gly Thr Asn Gly Lys Ser Gly Arg
            245             250             255


Thr Cys Glu Met Ile Tyr Glu Asn Val Glu Val Pro Lys Glu Glu Cys
            260             265             270


Ser Val Glu Ser Lys Ile Ala Gly Gly Val Ala Leu Ala Leu Leu Met
    275             280             285


Leu Ala Gly Gly Gly Gly Tyr Thr Tyr Tyr Lys Lys Tyr Gly Leu Ser
    290             295             300
```

```
Arg Val Ser Glu Thr Thr Asn Leu Asp Glu Asp Phe Ala Asp Ser Ser
305             310             315             320


Gly Asn Arg Gly Val Arg Glu Ser Val Gly Glu Ala Tyr Thr Val Thr
                325             330             335


Asp Leu Asp Asp Gly Leu Trp Ser Gln Ser Asn Gln
            340             345


<210>   9
<211>   2259
<212>   DNA
<213>   Babesia bovis


<220>
<221>   CDS
<222>   (552)..(2189)


<400>   9
ataagatgta gcactgatgt gtgtactcgg actctgacac tggagtatag gctaccagaa      60

ctgggcgcaa ctccctaatg gagtgccgct cccaggaggc cacagaacaa tggagtacaa     120

cgctcaaaac cgcagtgaat gttagctaca atatgtacat attgtcatgg agttcgtaat     180

cctaacaaag gccattgtat cgtcaatgtg gtctaccagt ggacgtcgct tgtggaggcc     240

agggtacatc aaatccctga gaacacctat cgtccggtgt acggtggta atgggttact      300

ataaaagcaa atttaattgt agatattgta aaaaaactgt aaaattggtt agtgcttgca     360

ccgtcctggt cccgcgattt ggataccgct gtgctacgct ttgcacggaa tcacgacgtc     420

gtgcataacg ctgtgcttat gacttcgtac acatcaaacg actttaactg ccgttggttt     480

atatacgttg gcgttaggtt gttttgggtg ttattgtact gtggaatcat acacattcta     540

cacgtgtcat g atg gtg aag ttc cac aca tta tcg gtt gca gcc atc ctg      590
            Met Val Lys Phe His Thr Leu Ser Val Ala Ala Ile Leu
            1               5                   10

gcg att gct tca tcc aat act att ttt gct aca ttt aga tca aat gga     638
Ala Ile Ala Ser Ser Asn Thr Ile Phe Ala Thr Phe Arg Ser Asn Gly
    15                  20                  25

aaa acc ttc gga gat gaa tct gtt agc ctt cta gaa cat gaa agt acc     686
Lys Thr Phe Gly Asp Glu Ser Val Ser Leu Leu Glu His Glu Ser Thr
30                  35                  40                  45

agt ttg tct cgt ggt cct aga cca acc gaa gat caa atc agt cag tta     734
Ser Leu Ser Arg Gly Pro Arg Pro Thr Glu Asp Gln Ile Ser Gln Leu
                50                  55                  60

cca aaa aat gtt ttc ttt cta ttg gat aac agc att gat atg tct att     782
Pro Lys Asn Val Phe Phe Leu Leu Asp Asn Ser Ile Asp Met Ser Ile
                65                  70                  75
```

```
gaa act gga gaa gag aat cgt cat ttc ctc tcc gag ttt ttt aaa ttg        830
Glu Thr Gly Glu Glu Asn Arg His Phe Leu Ser Glu Phe Phe Lys Leu
        80              85              90

tta aaa aaa tat gaa gga ata aat gtt tca cta ata agg tac aat agt        878
Leu Lys Lys Tyr Glu Gly Ile Asn Val Ser Leu Ile Arg Tyr Asn Ser
    95              100             105

gaa gaa ccg tta ggt tcg acg aaa gca tta acc aac ggg gag ttg aaa        926
Glu Glu Pro Leu Gly Ser Thr Lys Ala Leu Thr Asn Gly Glu Leu Lys
110             115             120             125

aaa cta tcc gat aat att cct act aaa atg cct ttt gac att ggc gtt        974
Lys Leu Ser Asp Asn Ile Pro Thr Lys Met Pro Phe Asp Ile Gly Val
            130             135             140

gtt cct act ggt ata gga gct gcc ctc aaa cag ata aaa aca ttg tac        1022
Val Pro Thr Gly Ile Gly Ala Ala Leu Lys Gln Ile Lys Thr Leu Tyr
            145             150             155

cct gat cac gaa aag ttc ctt gtt ggg aac acc att act gag ttg gat        1070
Pro Asp His Glu Lys Phe Leu Val Gly Asn Thr Ile Thr Glu Leu Asp
            160             165             170

tat tct aaa gca ttg ggt aag gat att gtt gta atc gtg ttt act act        1118
Tyr Ser Lys Ala Leu Gly Lys Asp Ile Val Val Ile Val Phe Thr Thr
    175             180             185

ggc cac gtc att gat cca tat tta gca tat gat gag gca ttt gat gcc        1166
Gly His Val Ile Asp Pro Tyr Leu Ala Tyr Asp Glu Ala Phe Asp Ala
190             195             200             205

cgc cgt aat ggt gta aga ttt tac gtt att aat agg gga gga aag gca        1214
Arg Arg Asn Gly Val Arg Phe Tyr Val Ile Asn Arg Gly Gly Lys Ala
            210     -           215             220

aaa aac tat tgg act cag cta ttg gga tgc cac tac aat act tgt ttg        1262
Lys Asn Tyr Trp Thr Gln Leu Leu Gly Cys His Tyr Asn Thr Cys Leu
            225             230             235

agt tat att cgg gcc aaa ata aca agg cct tca cta tat ctc gat gtt        1310
Ser Tyr Ile Arg Ala Lys Ile Thr Arg Pro Ser Leu Tyr Leu Asp Val
            240             245             250

ttg gtg aac agg att gtg tct aaa cgc gcg aaa gat gcc gtt tgt ttg        1358
Leu Val Asn Arg Ile Val Ser Lys Arg Ala Lys Asp Ala Val Cys Leu
            255             260             265

gaa gtg tgg acg gat tat aaa cct aac act gaa aaa tcg gat gtg agg        1406
Glu Val Trp Thr Asp Tyr Lys Pro Asn Thr Glu Lys Ser Asp Val Arg
270             275             280             285

att atg act tct acg ttg aaa tta tac aaa acc ctt ctt act gga agc        1454
Ile Met Thr Ser Thr Leu Lys Leu Tyr Lys Thr Leu Leu Thr Gly Ser
            290             295             300

ttt gcg gag ara aac atc aaa ggt ctc aca tgt gat gag cag cta aag        1502
Phe Ala Glu Xaa Asn Ile Lys Gly Leu Thr Cys Asp Glu Gln Leu Lys
            305             310             315

gat atg cag aaa aga caa ata ttt tgc tac tca aat aag tgt gct ccc        1550
```

```
            Asp Met Gln Lys Arg Gln Ile Phe Cys Tyr Ser Asn Lys Cys Ala Pro
                    320                 325                 330

acg atc tat tca aga tct tat gtt gac tta gct att caa cgt ctt aat         1598
Thr Ile Tyr Ser Arg Ser Tyr Val Asp Leu Ala Ile Gln Arg Leu Asn
        335                 340                 345

gca aaa gat ttt aaa gag gta cta gat gag tca tct tac aga tca cgc         1646
Ala Lys Asp Phe Lys Glu Val Leu Asp Glu Ser Ser Tyr Arg Ser Arg
350                 355                 360                 365

agt ttg caa tca gtg gag aaa cat aat gag caa caa aca ggt tct caa         1694
Ser Leu Gln Ser Val Glu Lys His Asn Glu Gln Gln Thr Gly Ser Gln
                    370                 375                 380

gaa acg ctt tct gga agc gcc cgt gta gaa aca agc tta gaa agc tca         1742
Glu Thr Leu Ser Gly Ser Ala Arg Val Glu Thr Ser Leu Glu Ser Ser
                385                 390                 395

gta cct tca tcc tat gtg gca gaa ttg gga gaa agt gat aca gaa aca         1790
Val Pro Ser Ser Tyr Val Ala Glu Leu Gly Glu Ser Asp Thr Glu Thr
                400                 405                 410

tac aaa cag ttg gag tac ata gat aaa aat ggc gtc act gtc ttc aac         1838
Tyr Lys Gln Leu Glu Tyr Ile Asp Lys Asn Gly Val Thr Val Phe Asn
        415                 420                 425

gat gag ccc act gtt gtt gtc gat act ccc gag tac gta caa aag gtg         1886
Asp Glu Pro Thr Val Val Val Asp Thr Pro Glu Tyr Val Gln Lys Val
430                 435                 440                 445

cat gaa aga gaa atg cag ttt gat gaa gaa tcc acc cat ctt ccc aac         1934
His Glu Arg Glu Met Gln Phe Asp Glu Glu Ser Thr His Leu Pro Asn
                    450                 455                 460

tct ggt aac cac cat cca cct cat cac cga aag ggg gcc aac gga tcc         1982
Ser Gly Asn His His Pro Pro His His Arg Lys Gly Ala Asn Gly Ser
                465                 470                 475

ggt aaa aag acc acg atc gtc gtt ggt att ata tgc ctt gta gta ata         2030
Gly Lys Lys Thr Thr Ile Val Val Gly Ile Ile Cys Leu Val Val Ile
            480                 485                 490

tgc gcc gtc ata gcc ggc gcc tac cta tcc ctt tca cag caa gag tct         2078
Cys Ala Val Ile Ala Gly Ala Tyr Leu Ser Leu Ser Gln Gln Glu Ser
        495                 500                 505

gtg gaa ctc acc tct gaa gag ggt gac ttc ttg aac gac act acg ggt         2126
Val Glu Leu Thr Ser Glu Glu Gly Asp Phe Leu Asn Asp Thr Thr Gly
510                 515                 520                 525

ggt caa cct gag gta ctc gaa aca caa cag gtt gtg gat gca gag aac         2174
Gly Gln Pro Glu Val Leu Glu Thr Gln Gln Val Val Asp Ala Glu Asn
                    530                 535                 540

aaa aca tgg ttg taa gacacgaaac gggttgtcac agccaacata tacaaatgca        2229
Lys Thr Trp Leu
                545

gtttaaatta agtcactagt taaaaaaaaa                                        2259
```

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<210>  10
<211>  545
<212>  PRT
<213>  Babesia bovis

<220>
<221>  misc_feature
<222>  (305)..(305)
<223>  The 'Xaa' at location 305 stands for Arg, or Lys.

<400>  10

Met Val Lys Phe His Thr Leu Ser Val Ala Ala Ile Leu Ala Ile Ala
1               5                  10                  15


Ser Ser Asn Thr Ile Phe Ala Thr Phe Arg Ser Asn Gly Lys Thr Phe
            20                  25                  30


Gly Asp Glu Ser Val Ser Leu Leu Glu His Glu Ser Thr Ser Leu Ser
        35                  40                  45


Arg Gly Pro Arg Pro Thr Glu Asp Gln Ile Ser Gln Leu Pro Lys Asn
    50                  55                  60


Val Phe Phe Leu Leu Asp Asn Ser Ile Asp Met Ser Ile Glu Thr Gly
65                  70                  75                  80


Glu Glu Asn Arg His Phe Leu Ser Glu Phe Phe Lys Leu Leu Lys Lys
            85                  90                  95


Tyr Glu Gly Ile Asn Val Ser Leu Ile Arg Tyr Asn Ser Glu Glu Pro
            100                 105                 110


Leu Gly Ser Thr Lys Ala Leu Thr Asn Gly Glu Leu Lys Lys Leu Ser
        115                 120                 125


Asp Asn Ile Pro Thr Lys Met Pro Phe Asp Ile Gly Val Val Pro Thr
        130                 135                 140


Gly Ile Gly Ala Ala Leu Lys Gln Ile Lys Thr Leu Tyr Pro Asp His
145                 150                 155                 160


Glu Lys Phe Leu Val Gly Asn Thr Ile Thr Glu Leu Asp Tyr Ser Lys
                165                 170                 175


Ala Leu Gly Lys Asp Ile Val Val Ile Val Phe Thr Thr Gly His Val
            180                 185                 190
```

```
Ile Asp Pro Tyr Leu Ala Tyr Asp Glu Ala Phe Asp Ala Arg Arg Asn
    195             200             205


Gly Val Arg Phe Tyr Val Ile Asn Arg Gly Gly Lys Ala Lys Asn Tyr
    210             215             220


Trp Thr Gln Leu Leu Gly Cys His Tyr Asn Thr Cys Leu Ser Tyr Ile
225             230             235             240


Arg Ala Lys Ile Thr Arg Pro Ser Leu Tyr Leu Asp Val Leu Val Asn
            245             250             255


Arg Ile Val Ser Lys Arg Ala Lys Asp Ala Val Cys Leu Glu Val Trp
            260             265             270


Thr Asp Tyr Lys Pro Asn Thr Glu Lys Ser Asp Val Arg Ile Met Thr
    275             280             285


Ser Thr Leu Lys Leu Tyr Lys Thr Leu Leu Thr Gly Ser Phe Ala Glu
    290             295             300


Xaa Asn Ile Lys Gly Leu Thr Cys Asp Glu Gln Leu Lys Asp Met Gln
305             310             315             320


Lys Arg Gln Ile Phe Cys Tyr Ser Asn Lys Cys Ala Pro Thr Ile Tyr
            325             330             335


Ser Arg Ser Tyr Val Asp Leu Ala Ile Gln Arg Leu Asn Ala Lys Asp
            340             345             350


Phe Lys Glu Val Leu Asp Glu Ser Ser Tyr Arg Ser Arg Ser Leu Gln
    355             360             365


Ser Val Glu Lys His Asn Glu Gln Gln Thr Gly Ser Gln Glu Thr Leu
    370             375             380


Ser Gly Ser Ala Arg Val Glu Thr Ser Leu Glu Ser Ser Val Pro Ser
385             390             395             400


Ser Tyr Val Ala Glu Leu Gly Glu Ser Asp Thr Glu Thr Tyr Lys Gln
            405             410             415


Leu Glu Tyr Ile Asp Lys Asn Gly Val Thr Val Phe Asn Asp Glu Pro
            420             425             430


Thr Val Val Val Asp Thr Pro Glu Tyr Val Gln Lys Val His Glu Arg
```

```
          435                 440                 445
```

```
  Glu Met Gln Phe Asp Glu Glu Ser Thr His Leu Pro Asn Ser Gly Asn
      450                 455                 460
```

```
  His His Pro Pro His His Arg Lys Gly Ala Asn Gly Ser Gly Lys Lys
  465                 470                 475                 480
```

```
  Thr Thr Ile Val Val Gly Ile Ile Cys Leu Val Val Ile Cys Ala Val
              485                 490                 495
```

```
  Ile Ala Gly Ala Tyr Leu Ser Leu Ser Gln Gln Glu Ser Val Glu Leu
              500                 505                 510
```

```
  Thr Ser Glu Glu Gly Asp Phe Leu Asn Asp Thr Thr Gly Gly Gln Pro
          515                 520                 525
```

```
  Glu Val Leu Glu Thr Gln Gln Val Val Asp Ala Glu Asn Lys Thr Trp
      530                 535                 540
```

```
  Leu
  545
```

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<210>  11
<211>  22
<212>  DNA
<213>  Artificial

<220>
<223>  primer 1

<400>  11
ccacggctct ggaatctatg tc                                        22


<210>  12
<211>  24
<212>  DNA
<213>  Artificial

<220>
<223>  primer 2

<400>  12
caaaaggata cctatatttg gtac                                      24


<210>  13
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<220>
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<223>   Primer 3

<400>   13
tgtggtagat gaatctgcta gtatatc                                    27


<210>   14
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<220>
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<400>   14
ctatgccacg gcattcagca acattta                                    27


<210>   15
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<212>   DNA
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<220>
<223>   Primer 5

<400>   15
cccggatcca tgcagttaca taacaaa                                    27


<210>   16
<211>   27
<212>   DNA
<213>   Artificial

<220>
<223>   Primer 6

<400>   16
gggaagcttc tgagcaaagg aaatagg                                    27


<210>   17
<211>   27
<212>   DNA
<213>   Artificial

<220>
<223>   Primer 7

<400>   17
cccgaattcg tggtagatga atctgct                                    27


<210>   18
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<220>
<223>   Primer 8
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<400> 18
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<210> 19
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<212> DNA
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<220>
<223> Primer 9

<400> 19
cccgaattcc atgatggtga agttccacac   30

<210> 20
<211> 29
<212> DNA
<213> Artificial

<220>
<223> Primer 10

<400> 20
cccgtcgacg ttggccccct ttcggtgat   29